CLAIMS

What is claimed is:

1. An optical pickup actuator for use with an objective lens on a base, comprising:

a lens holder holding the lens;

a suspension movingly supporting the lens holder so that the lens holder is movable with respect to the base; and

a magnetic circuit to drive the objective lens, wherein the magnetic circuit comprises:

a pair of unipolar magnetized magnets positioned on the base to face each other,

a focusing coil positioned in the lens holder between the pair of unipolar magnetized magnets,

a plurality of tracking coils, wherein each of the plurality of tracking coils is positioned at a side of the focusing coil facing one of the unipolar magnetized magnets, and

a plurality of tilt coils positioned in an upper portion and/or a lower portion of the focusing coil corresponding to an upper direction and a lower direction of a central axis of the objective lens.

2. The optical pickup actuator of claim 1, wherein the optical pickup actuator is symmetrically arranged and the pair of unipolar magnetized magnets are positioned on the base to face opposing sides of the lens holder, the focusing coil is wound around the lens holder, the tracking coils are positioned at a side of the lens holder facing the unipolar magnetized magnet, and the tilt coils are positioned in the upper portion and/or the lower portion of the lens holder.

3. The optical pickup actuator of claim 2, wherein the tracking coils are wound on a plurality of first reels formed in the lens holder to wind the tracking coils or the tracking coils are separately attached to the lens holder.

4. The optical pickup actuator of claim 2, further comprising a first reel formed at each opposing side of the lens holder in a radial direction of the objective lens on the upper portion and/or the lower portion of the lens holder, and the tilt coils are wound on each of the first reels.

5. The optical pickup actuator of claim 2, wherein an installation portion for installing the objective lens is formed in the lens holder spaced apart from the tilt coils in the upper portion of the lens holder such that an effect of heat generated by the focus coil, tracking coils and/or tilt coils on the objective lens is reduced.

6. The optical pickup actuator of claim 2, wherein at least one thermal transfer blocking hole is formed in the lens holder to reduce an effect of heat generated in the focusing coil, the tracking coils and/or the tilt coils on the objective lens.

7. The optical pickup actuator of claim 1, wherein the optical pickup actuator is asymmetrically arranged and the objective lens is positioned on one side of the lens holder, the pair of unipolar magnetized magnets are positioned on the base to face each other at one side of the objective lens, and the focusing coil, the plurality of tracking coils, and the plurality of tilt coils are in a coil assembly mountable on the lens holder to be positioned between the unipolar magnetized magnets.

8. The optical pickup actuator of claim 7, wherein the coil assembly further comprises a bobbin on which at least the focusing coil is aligned and wound.

9. The optical pickup actuator of claim 8, further comprising at least one second reel formed on the bobbin to wind the tracking coils.

10. The optical pickup actuator of claim 8, further comprising a second reel formed on each side of the bobbin in a radial direction of the objective lens on an upper portion and/or a lower portion of the bobbin, and the tilt coils are wound on each of the second reels.

11. The optical pickup actuator of claim 7, wherein the focusing coil, the tracking coils, and the tilt coils are bulk-type coils wound prior to assembly of the optical pickup actuator, and the tracking coils and the tilt coils are attached to the focusing coil in the coil assembly.

12. The optical pickup actuator of claim 7, further comprising a bridge placed above the magnetic circuit to guide a magnetic flux.

13. The optical pickup actuator of claim 12, further comprising at least one of a pair of external yokes extending from the bridge to support the pair of unipolar magnetized magnets and a pair of internal yokes positioned inside a cavity defined by walls of the tilt coils of the coil assembly.

14. The optical pickup actuator of claim 7, further comprising at least one of a pair of external yokes positioned on the base and on which the unipolar magnetized magnets are mountable, and a pair of internal yokes positioned on the base inside a cavity defined by walls of the tilt coils.

15. The optical pickup actuator of claim 7, wherein the tracking coils are positioned nearer the unipolar magnetized magnets than the focusing coil.

16. The optical pickup actuator of claim 7, wherein the focusing coil is positioned nearer the unipolar magnetized magnets than the tracking coils.

17. The optical pickup actuator of claim 1, further comprising at least one of a pair of external yokes positioned on the base and on which the unipolar magnetized magnets are mountable, and a pair of internal yokes positioned on the base inside a cavity defined by walls of the tilt coils.

18. The optical pickup actuator of claim 1, wherein the tracking coils are positioned nearer the unipolar magnetized magnets than the focusing coil.

19. The optical pickup actuator according to claim 1, wherein the focusing coil is positioned nearer the unipolar magnetized magnets than the tracking coils.

20. The optical pickup actuator according to claim 1, wherein the magnetic circuit includes only a single pair of unipolar magnetized magnets.

21. The optical pickup actuator according to claim 1, wherein the actuator is a two-sided, three axis driving pickup actuator.

22. An optical pickup actuator having an asymmetric structure for driving an objective lens positioned on a base, comprising:

a lens holder to hold the objective lens;

a suspension movingly supporting the lens holder so that the lens holder is movable with respect to the base; and

a magnetic circuit, wherein the magnetic circuit comprises:

a pair of unipolar magnetized magnets positioned on the base to face each other at one side of the objective lens, and

a coil assembly mountable on the lens holder between the pair of unipolar magnetized magnet, wherein the coil assembly comprises:

a pair of focusing coils positioned in the lens holder between the pair of unipolar magnetized magnets, and

a plurality of tracking coils positioned on at least one side of the pair of focusing coils to face the unipolar magnetized magnets.

23. The optical pickup actuator of claim 22, wherein the coil assembly uses bulk type coils in which the focusing coils and the tracking coils are previously wound, and the plurality of tracking coils are attached to the pair of focusing coils in the coil assembly.

24. The optical pickup actuator according to claim 22, wherein the magnetic circuit includes only a single pair of unipolar magnetized magnets.

25. The optical pickup actuator according to claim 22, wherein the actuator is a two-sided, three axis driving pickup actuator.

26. An optical recording and/or reproducing apparatus for recording and/or reproducing information from an optical information storage medium, comprising:

an optical pickup, wherein the optical pickup comprises:

an actuator positioned on a base to be movable in a radial direction of the optical information storage medium, and

a focusing servo and a tracking servo; and

a controller to control the focusing and tracking servos,

wherein the actuator comprises:

a lens holder holding an objective lens,

a suspension movingly support the lens holder so that the lens holder is movable with respect to the base, and

a magnetic circuit to drive the objective lens comprising:

a pair of unipolar magnetized magnets positioned on the base to face each other,

a focusing coil positioned in the lens holder between the pair of unipolar magnetized magnets,

a plurality of tracking coils, wherein each of the plurality of tracking coils is positioned at a side of the focusing coil facing the unipolar magnetized magnet, and

a plurality of tilt coils positioned in an upper portion and/or a lower portion of the focusing coil corresponding to an upper direction and a lower direction of a central axis of the objective lens.

27. The apparatus of claim 26, wherein the optical pickup actuator is symmetrically arranged and the pair of unipolar magnetized magnets are positioned on the base to face opposing sides of the lens holder, the focusing coil is wound around the lens holder, the tracking coils are positioned at a side of the lens holder facing the unipolar magnetized magnet, and the tilt coils are positioned in an upper portion and/or a lower portion of the lens holder.

28. The apparatus of claim 27, wherein the tracking coils are wound on a plurality of first reels formed on the lens holder or the tracking coils are separately attached to the lens holder

29. The apparatus of claim 27, further comprising a first reel formed at each opposing side of the lens holder in a radial direction of the objective lens on the upper portion and/or the lower portion of the lens holder, and the tilt coils are wound on each of the first reels.

30. The apparatus of claim 27, wherein at least one thermal transfer blocking hole is formed in the lens holder to reduce an effect of heat generated in the focusing coil, the tracking coils and/or the tilt coils on the objective lens.

31. The apparatus of claim 26, wherein the optical pickup actuator is asymmetrically arranged and the objective lens is positioned on one side of the lens holder, the pair of unipolar magnetized magnets are positioned on the base to face each other at one side of the objective lens, and the focusing coil, the tracking coils, and the tilt coils are positioned on the coil assembly to be positioned between the unipolar magnetized magnets.

32. The apparatus of claim 31, wherein the coil assembly further comprises a bobbin on which the focusing coil is aligned and wound.

33. The apparatus of claim 32, wherein at least one second reel is formed on the bobbin to wind the tracking coils.

34. The apparatus of claim 32, wherein a second reel is formed on each opposing side of the bobbin in a radial direction of the objective lens on an upper portion and/or a lower portion of the bobbin, and the tilt coils are wound on each of the second reels.

35. The apparatus of claim 31, wherein the coil assembly uses bulk type coils in which the focusing coil, the tracking coils, and the tilt coils are wound prior to assembly of the optical pickup actuator, and the tracking coils and the tilt coils are attached to the focusing coil in the coil assembly.

36. The apparatus of claim 31, further comprising a bridge positioned above the magnetic circuit to guide magnetic flux.

37. The apparatus of claim 36, further comprising at least one of a pair of external yokes extending from the bridge to support the pair of unipolar magnetized magnets and a pair of internal yokes positioned inside a cavity defined by walls of the tilt coils of the coil assembly.

38. The apparatus of claim 31, further comprising:

a bobbin, and

at least one of a pair of external yokes formed on the base and on which the unipolar magnetized magnets are positioned and a pair of internal yokes formed in the base to be insertable inside a cavity defined by walls of the bobbin.

39. The apparatus of claim 31, wherein the tracking coils are positioned nearer the unipolar magnetized magnets than the focusing coil.

40. The apparatus according to claim 31, wherein the focusing coil is positioned nearer the unipolar magnetized magnets than the tracking coils.

41. The apparatus of claim 26, further comprising:

a bobbin, and

at least one of a pair of external yokes formed on the base and on which the unipolar magnetized magnets are positioned and a pair of internal yokes formed in the base to be insertable inside a cavity defined by walls of the bobbin.

42. The apparatus of claim 26, wherein the tracking coils are placed nearer the unipolar magnetized magnets than the focusing coil,

43. The apparatus according to claim 26, wherein the focusing coil is placed nearer the unipolar magnetized magnets than the tracking coils.

44. The apparatus according to claim 26, wherein the magnetic circuit includes only a single pair of unipolar magnetized magnets.

45. The apparatus according to claim 26, wherein the actuator is a two-sided, three axis driving pickup actuator.

46. An optical recording and/or reproducing apparatus for recording and/or reproducing information from an optical information storage medium, comprising:

an optical pickup comprising:

an actuator for driving an objective lens positioned on a base to be movable in a radial direction of the optical information storage medium and

a focusing servo and a tracking servo; and

a controller to control the focusing and tracking servos,

wherein the actuator has an asymmetric structure and comprises:

a lens holder to hold the objective lens,

a suspension movingly supporting the lens holder so that the lens holder is movable with respect to the base, and

a magnetic circuit comprising:

a pair of unipolar magnetized magnets positioned on the base to face each other at one side of the objective lens, and

a coil assembly comprising:

a pair of focusing coils positioned in the lens holder between the pair of unipolar magnetized magnets arranged to intersect a direction in which the pair of unipolar magnetized magnets are arranged], and

a plurality of tracking coils positioned on at least one side of the focusing coils facing the unipolar magnetized magnet, and the coil assembly mountable on the lens holder between the pair of unipolar magnetized magnets, to drive the objective lens.

47. The apparatus of claim 46, wherein the coil assembly uses bulk type coils in which the focusing coils and the tracking coils are previously wound, and the the plurality of tracking coils are attached to the pair of focusing coils in the coil assembly.

48. A method to increase precision of control of a movable lens holder holding an objective lens of an optical pickup actuator, comprising:

controlling a direction of a magnetic flux generated in a pair of unipolar magnets;

controlling a direction of flowing current through each of a pair of tilt coils positioned in an upper portion of the lens holder; and

moving the movable lens holder,

wherein the tilt coils are wound in opposite directions and face the pair of unipolar magnets.

49. The method according to claim 48, wherein a first reel is formed on an upper portion of the objective lens holder in a radial direction of the objective lens.

50. The method according to claim 48, wherein the tilt coils are wound parallel to the focusing coils, and the moving the movable lens holder comprises driving the holder in a radial tilt direction.

51. The method according to claim 48, further comprising decreasing interference in a focusing movement by centering a radial tilt driving force near the objective lens.